

Assignment 9

Textbook Assignment: "Upper Air Analysis (Continued)"; "Tropical Meteorology and Analysis."
Pages 8-5-1 through 9-3-15.

Learning Objective: Define vorticity, explain the two types, and explain how CAVT tables are used.

IN ANSWERING QUESTIONS 9-1 THROUGH 9-3, MATCH THE TERMS LISTED IN COLUMN B WITH ITS DEFINITION IN COLUMN A.

	<u>A. DEFINITIONS</u>	<u>B. TERMS</u>
9-1.	Occurs when spin is imparted to a parcel	1. Positive vorticity
9-2.	Spin created by wind shear and curvature	2. Vorticity
9-3.	Classification given to cyclonically turning parcels in the Northern Hemisphere	3. Relative vorticity
9-4.	What is the purpose of CAVT tables?	
	1. To track low-pressure systems	
	2. To measure vorticity	
	3. To determine long-wave movement	
	4. To measure relative vorticity	

Learning Objective: Recognize the weather differences that occur within the tropics, the representativeness of weather elements, and what drives our approach to analyzing the weather over this region.

- 9-5. The tropical latitudes are the source region for what air mass(es)?
- Equatorial only
 - Tropical only
 - Equatorial and tropical
 - Polar, equatorial and tropical
- 9-6. Why are polar fronts difficult to locate in the tropics?
- Topographical extremes
 - Lack of reporting stations
 - Polar air is quickly modified, making for minimal temperature contrast across the front
 - Polar air masses do not penetrate tropical latitudes
- 9-7. With many polar fronts that enter the tropics and are modified, the only clues to their continued existence is
- the temperature and dewpoint contrast
 - lower- and upper-level cyclonic wind shear
 - temperature contrast across the fronts and the fronts' associated convected activity
 - convective activity produced by low-level cyclonic wind shear
- 9-8. In what tropical wind belt(s) will you find the Intertropical Convergence Zone (ITCZ)?
- Doldrums only
 - Horse latitudes only
 - Trades only
 - Doldrums and horse latitudes

- 9-9. The tropical wind belts shift north and south with the seasons. By July, the equatorial low-pressure trough is located
1. in the horse latitudes of the Northern Hemisphere
 2. near the equator but entirely in the Northern Hemisphere
 3. a few degrees into the Southern Hemisphere
 4. in and around the equator encompassing both hemispheres
- 9-10. The width of the doldrum belt is indirectly related to
1. the seasons
 2. diurnal pressure changes
 3. the strength of the tradewinds
 4. the geography of the area
- 9-11. What is the dominant feature of the horse latitudes?
1. ITCZ
 2. The subtropical high-pressure centers
 3. The equatorial low-pressure trough
 4. Strong westerlies
- 9-12. Which of these weather occurrence's characterize the trade wind belts separating the doldrums and horse latitudes?
1. Fair weather cumulus clouds
 2. Moderate northeasterly winds in the Northern Hemisphere and southeasterly winds in the Southern Hemisphere
 3. Low-level temperature inversions
 4. Each of the above
- 9-13. In which tropical area is the trade inversion most pronounced?
1. Midoceanic
 2. Mountainous islands
 3. West coasts of continents
 4. Eastern portions of the ocean
- 9-14. The tradewind inversion has a significant effect on the weather in the tropics. Which of the following types of weather is most likely to occur when the inversion lowers?
1. Significant convective activity
 2. Extensive cloud cover
 3. Rain
 4. Haze
- 9-15. What is the mean air temperature over tropical oceans?
1. 70°F
 2. 75°F
 3. 80°F
 4. 85°F
- 9-16. With regard to mountainous tropical islands, when and where do convective clouds reach their maximum vertical extent?
1. On the leeward side at night
 2. On the windward side at night
 3. On the leeward side during the day
 4. On the windward side during the day
- 9-17. Temperature and pressure variations in the tropics are greatest over which of the following physical features?
1. Islands
 2. Water
 3. Coasts
 4. Continents
- 9-18. Which of the following occurrences cause(s) many continental tropical areas to experience wet and dry seasons?
1. Monsoons only
 2. Latitudinal shifts in the wind belts only
 3. Monsoons and latitudinal shifts in the wind belts
- 9-19. What is the most predominant cloud type found in the tropics?
1. Cumulonimbus
 2. Cumulus
 3. Stratocumulus
 4. Cirrus
- 9-20. Over what region of the tropics would you expect to find an abundance of isolated high clouds?
1. Within the trade wind belt and associated with the subtropical jet stream
 2. East of the subtropical high-pressure centers in tongues of warm upper-level air
 3. In the doldrums from anvil tops of cumulonimbus clouds
 4. Within the horse latitudes associated with the higher pressure

9-21. Surface winds are not always representative of actual conditions. Where do we find the most representative surface winds in the tropics?

1. Island mountains
2. Along coasts
3. At sea in the vicinity of rainshowers
4. Over flat stretches of land during the day

9-22. Three-hour pressure tendencies are reported in midlatitudes. Except in the vicinity of tropical storms, why aren't three-hour pressure tendencies reported in the tropics?

1. The three-hour change is too small
2. The day to night change in pressure masks any synoptic change
3. Cloud systems passing over a station often cause a .1 millibar change in barometric pressure
4. For all the above reasons

9-23. Twenty-four hour pressure changes of what magnitude warrant careful attention by the analyst?

1. .1 to 1.0 mb
2. .5 to 1.0 mb
3. 1.0 to 1.5 mb
4. 1.5 to 2.5 mb

9-24. At which of the following tropical locations would you expect to find the most representative temperatures?

1. On the lee side of mountainous islands at night
2. On small, flat islands well removed from continental effects
3. In the vicinity of rainshower activity
4. At the fringes of the tropics

Learning Objective: Recognize analysis procedures for time sections, low- and upper-level streamlines, surface and upper-air charts, 24-hour pressure change charts, and weather distribution charts.

9-25. Why is the analysis of time sections at key stations within the tropics considered important?

1. Most of the weather changes in the tropics are directly time related
2. It is an effective way of denoting diurnal changes
3. Errors and unrepresentative values in station reports are easily detected
4. All the above are reasons

9-26. Time-cross sections are an effective tool for determining the representativeness of 24-hour height changes within the atmosphere. When marked upper-height falls (30 mtrs/24-hours) are noted in data taken off the 1200z sounding from a key station and are followed by rises of similar magnitude at 0000z, what should the analyst assume?

1. A tropical disturbance moved over the station
2. The radiosonde observations at the stations are correct
3. One of the radiosonde observations is in error until a check of the wind and weather changes prove otherwise
4. That weather conditions are normal, because 30 mtr height changes in a 24-hour period are common in the tropics

9-27. How are trough or shear lines distinguished on a time section?

1. Orange line
2. Purple alternating dots and dashes
3. Blue dashes
4. Red dashes

9-28. In what increments are 24-hour height change contours drawn on time sections?

1. 30 meters
2. 30 meters above 400 mb and 15 meters below 400 mb
3. 60 meters above 500 mb and 30 meters below 500 mb
4. 60 meters

- 9-29. The strength of tropical inversions plays an important part in determining the type of weather that will occur. What is/are the best measure(s) of inversion strength?
1. The difference in ambient temperature between the top and bottom of the inversion layer
 2. The difference in potential temperature between the top and bottom of the inversion layer
 3. The thickness of the inversion layer
 4. Both 2 and 3 are best
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- Learning Objective: Identify techniques applied in performing tropical analysis, and recognize the types of analyses which may be performed.
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- 9-30. Weather occurrences in the tropics are more apt to be explained using wind analyses.
1. True
 2. False
- 9-31. What is/are the most common level(s) used in tropical streamline analysis?
1. Surface
 2. 850-mb level
 3. 500-mb level
 4. Gradient level and the 300- or 200-mb level depending on the time of year
- 9-32. Which of the following cumulus cloud patterns is most apt to provide the best indication of the surface wind?
1. Long, wide cloud lines with narrow openings
 2. Very short, narrow, zig-zagging lines
 3. Long, narrow, straight lines
 4. Very long, very narrow, wavy lines
- 9-33. Which, if any, of the following features is a drawback to conducting a streamline analysis of the gradient wind level?
1. The wind fluctuations are extreme in the trade wind belt
 2. Orographic influences
 3. Non-availability of gradient wind observations
 4. None of the above
- 9-34. Satellite pictures are often used to determine upper-level windflow. What is/are the most useful cloud pattern(s) used for this purpose?
1. Cirrus cloud shields associated with subtropical jet streams
 2. Cirrus spissatus (plumes of cirrus associated with cumulonimbus)
 3. Both 1 and 2 are most useful
 4. Transverse cirrus bands
- 9-35. The recommended and most complete method of streamline analysis is the
1. discontinuous method
 2. qualitative method
 3. isotach method
 4. streamline-isotach method
- 9-36. Why is discontinuous streamline analysis more suitable for upper levels?
1. Far fewer reports are available at these levels
 2. Light winds prevail
 3. Fairly strong winds prevail
 4. Most of the winds at these levels must be discarded
- 9-37. Streamlines in the wind field away from which neighboring streamlines diverge are known as
1. negative asymptotes
 2. positive asymptotes
 3. singular points
 4. cusps
- 9-38. Which of the following streamline analysis features are analogous to a col?
1. Vortices
 2. Anticyclonic outdrafts
 3. Cyclonic outdrafts
 4. Neutral points
- 9-39. The recommended area to begin a streamline analysis is the
1. doldrums
 2. tradewind belt
 3. subtropical high-pressure belt
 4. area poleward of the subtropical ridge
- 9-40. What is the correct isotach interval used in streamline analysis?
1. 5 knots
 2. 5 knots up to 20 knots, then every 10 knots thereafter
 3. 5 knots up to 25 knots, then every 10 knots thereafter
 4. 10 knots

- 9-41. An area shaded in purple on a streamline analysis is representative of
1. an area of wind speeds 20 knots or greater
 2. an area of wind speeds 30 knots or greater
 3. an area of wind speeds 10 knots or less
 4. an area of wind speeds that are less than 5 knots
- 9-42. Isotachs kink when they cross streamlines.
1. True
 2. False
- 9-43. The general effect of increasingly stronger convergence is an increase in
1. all cloud types and amounts
 2. convective cloud heights
 3. mid cloud amounts
 4. high cloud amounts
- 9-44. Where low-level streamlines indicate moderate to strong divergence, what is the predominant cloud type found over such an area?
1. Stratus
 2. Cumulus humilis
 3. Cumulus congestus
 4. Cumulonimbus
- 9-45. When a weather distribution analysis is made without the benefit of previous distribution charts, the first thing you should do is to
1. outline the middle clouds
 2. outline the high clouds
 3. study the available aircraft reports
 4. study the climatology of the analysis area
- 9-46. Isobaric analysis is NOT the most important tool of the tropical meteorologist because of this region's weak pressure gradient. To compensate for the gradient, isobars are normally drawn at what intervals over the horse latitudes, trades and doldrums respectively?
1. 4 mb, 4 mb, and 2 mb
 2. 4 mb, 2 mb, and 2 mb
 3. 4 mb, 2 mb, and 1 mb
 4. 2 mb, 2 mb, and 2 mb
- 9-47. An area on a weather distribution chart showing few middle and high clouds and large amounts of cumulus humilis indicates
1. suppressed convection
 2. an approaching storm
 3. the normal cloud distribution in the tropics
 4. the beginning of the dry season
- 9-48. As a check on the isobaric analysis of tropical oceans, the analyst should
1. personally check each individual pressure report
 2. analyze the 3-hourly isallobaric field
 3. analyze the 24-hour pressure changes
 4. check the weather distribution chart
- 9-49. What constant-pressure surface is considered the best level for tropical upper-air analysis?
1. 1000 mb
 2. 700 mb
 3. 500 mb
 4. 200 mb
- 9-50. How can you be reasonably certain an upper-air analysis is in error?
1. The upper heights are radically different from norms shown on frequency distribution charts
 2. A large area of cold or warm air suddenly appears without a foundation in continuity
 3. The thickness fields shown on the charts immediately preceding the current chart differ radically
 4. All of the above are indicators
- 9-51. What is the primary chart used in differential analysis in the tropics?
1. 1000 mb
 2. 700 mb
 3. 500 mb
 4. 200 mb
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- Learning Objective: Distinguish between the various types of tropical phenomena, and identify characteristics of tropical systems in preparation for tropical analysis.
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9-52. A line or narrow zone across which there is an abrupt change in the horizontal wind component parallel to this area is known as

1. a tropical wave
2. a shear line
3. an induced trough
4. an intense intertropical front

9-53. Which of the following is an example of a shear line?

1. Monsoon
2. Upper tropospheric ridge
3. Remnant of an old cold front in the tropics
4. Each of the above

9-54. On transiting poleward through the trades, your task group passes beneath a rather extensive cloud band. Periods of rain and instability showers reduce the visibility and lower the ceiling. The wind speed doubles but the east-northeast wind direction does not change. The latest weather map shows no front in the area. Which of the following tropical phenomena is most likely being encountered?

1. The ITCZ
2. An easterly wave
3. A shear line
4. An induced trough

9-55. It is 0800Z and you have just completed the 0600Z surface analysis. A stable easterly wave has formed and is positioned 60 miles east of your station. Since there is no past history with which to gauge the wave's speed, your best guess as to its time of arrival at your station would be

1. today at 1200Z
2. today at 1400Z
3. this evening at 1800Z
4. tomorrow at 0600Z

9-56. In reference to the Intertropical convergence Zone (ITCZ), which of the following statements would be considered correct?

1. The cloud band may be continuous for thousands of miles, while at other times it is discontinuous
2. Vertical cloud patterns may exist within the ITCZ
3. Disturbances may form within the cloud band of the ITCZ
4. All of the above statements are correct

9-57. Where the ITCZ lies over continents, when does the maximum and minimum rainfall occur?

1. Maximum - around noon; minimum - just before dawn
2. Maximum - just before dawn; minimum - late morning
3. Maximum - early afternoon; minimum - around midnight
4. Maximum - just before dawn; minimum - just before nightfall

9-58. Which statement concerning tropical cyclones is correct?

1. Tropical cyclones are small in comparison to extra-tropical cyclones
2. Tropical cyclones rank second to tornadoes in their level of destructiveness
3. Tropical cyclones are distinctly different depending on the region in which they form
4. Tropical cyclones are classified according to the size of their closed circulation

IN QUESTIONS 9-59 THROUGH 9-61, SELECT FROM COLUMN B THE TROPICAL CYCLONE STAGE IDENTIFIED WITH THE OCCURRENCE OF EACH EVENT LISTED IN COLUMN A.

A. EVENTS

B. STAGES

9-59. The transformation of the storm into an extra-tropical cyclone

1. Formative
2. Immature

9-60. The appearance of westerly winds in low tropical latitudes where easterly winds normally prevail

3. Mature
4. Decaying

9-61. The organization of the wind system into a tight, symmetrical ring around the eye

9-62. When a tropical storm is moving in a westerly direction in the Northern Hemisphere, the strongest winds are usually found in which section of the storm?

1. Left front quadrant
2. Right front quadrant
3. Left rear quadrant
4. Right rear quadrant

- 9-63. The most significant cloud types found within a tropical cyclone are
1. precipitating middle clouds
 2. the advance cirrus and cirrostratus
 3. heavy cumulus and cumulonimbus
 4. all the low cloud species
- 9-64. One of the characteristics of the eye of a tropical cyclone is a sudden
1. decrease in the wind speed
 2. decrease in temperature
 3. increase in cloudiness
 4. increase in the intensity of the precipitation
- 9-65. Your ship is operating in the Caribbean Sea in the month of September and encounters heavy swell waves with periods of 9 to 15 seconds. What, if anything, might these waves signify?
1. The season's first extratropical cyclone
 2. A surge in the trade winds
 3. The presence of a tropical storm within the Caribbean or the southern North Atlantic Ocean
 4. Nothing - these waves are common in the trades
- 9-66. Unless a tropical cyclone is unusually developed, the 200-mb level is marked by
1. cyclonic inflow
 2. cyclonic outflow
 3. anticyclonic inflow
 4. anticyclonic outflow

IN QUESTIONS 9-67 THROUGH 9-69, SELECT FROM COLUMN B THE DATES OF HIGHEST FREQUENCY OF TROPICAL CYCLONE FORMATION IN THE AREAS LISTED IN COLUMN A.

A. AREAS	B. DATES
9-67. Gulf of Mexico	1. Jan. through Mar.
9-68. Coral Sea and West of Tuamotu Islands	2. Jun. through Nov.
	3. Jul. through Oct.
9-69. Marshall, Caroline, and Phillipine Islands and China Sea	4. Aug. through Oct.

- 9-70. Your ship is operating in the Sea of Japan. Which of the following facilities has the responsibility of issuing tropical advisories/warnings for this area?
1. National Weather Service (NWS) Hurricane Center Miami, Florida
 2. NWS Hurricane Center Pearl Harbor, Hawaii
 3. NAVWESTOCEANCEN Pearl Harbor, Hawaii
 4. NAVOCEANCOMCEN Joint Typhoon Warning Center at Guam
- 9-71. After the latest hurricane warning is plotted, the track shows the hurricane will get close enough to your station to generate hurricane force winds within 72 hours. What condition of readiness should be set?
1. Hurricane Condition I
 2. Hurricane Condition II
 3. Hurricane Condition III
 4. Hurricane Condition IV
- 9-72. During what season and over what regions is the tropical easterly jet stream a persistent feature?
1. Summer over southern Europe and northern Africa
 2. Summer over extreme southern Asia and northern Africa
 3. Winter over extreme southern Asia and northern Africa
 4. Winter over southern Europe and northern Africa
- 9-73. The tropical easterly jet stream flows east to west and the coldest air is found on the equatorward side of its axis.
1. True
 2. False